CLAIMS

1. Method for the production of acrylic acid from propane, in which a gaseous mixture comprising propane, molecular oxygen, water vapour, and optionally an inert gas is passed over a catalyst with the formula (I):

$$Mo_1V_aTe_bNb_cSi_dO_x \text{ (I)}$$

in which:

- a is comprised between 0.006 and 1, inclusive;
- b is comprised between 0.006 and 1, inclusive;
- c is comprised between 0.006 and 1, inclusive;
- d is comprised between 0 and 3.5, inclusive; and
- x is the quantity of oxygen bound to the other elements and depends on their oxidation state,

in order to oxidize the propane to acrylic acid, **characterized in that** the molar ratio propane/molecular oxygen in the initial gaseous mixture is greater than or equal to 0.5.

2. Method according to claim 1, in which the molar proportions of the constituents of the initial gaseous mixture are as follows:
propane/O_2/inert gas/H_2O (vapour) = 1/0.05-2/1-10/1-10;
and preferably 1/0.1-1/1-5/1-5.

3. Method according to claim 1 or claim 2, in which, in the catalyst of formula (I):

- a is comprised between 0.09 and 0.8, inclusive;
- b is comprised between 0.04 and 0.6, inclusive;
- c is comprised between 0.01 and 0.4, inclusive; and
- d is comprised between 0.4 and 1.6, inclusive.

4. Method according to one of claims 1 to 3, characterized in that the oxidation reactions are carried out at a temperature of 200 to 500°C.

5. Method according to claim 4, characterized in that the oxidation reaction is carried out at a temperature of 250 to 450°C.

6. Method according to one of claims 1 to 5, characterized in that the oxidation reactions are carried out at a pressure of 1.01×10^4 to 1.01×10^6 Pa (0.1 to 10 atmospheres).

7. Method according to claim 6, characterized in that the oxidation reactions are carried out at a pressure of 5.05×10^4 to 5.05×10^5 Pa (0.5-5 atmospheres).

8. Method according to one of claims 1 to 7, characterized in that it is used until there is a reduction ratio of the catalyst comprised between 0.1 and 10 g of oxygen per kg of catalyst.

9. Method according to one of claims 1 to 8, characterized in that once the catalyst has at least partially changed to the reduced state, its regeneration is carried out according to reaction (3):

$$SOLID_{reduced} + O_2 \rightarrow SOLID_{oxidized} \quad (3)$$

by heating in the presence of oxygen or a gas containing oxygen at a temperature of 250 to 500°C, for a period necessary for the reoxidation of the catalyst.

10. Method according to claim 9, characterized in that the oxidation and the regeneration (3) reactions are carried out in a device with two stages, namely a reactor and a regenerator which operate simultaneously and in which two catalyst loads alternate periodically.

11. Method according to claim 9, characterized in that the oxidation and the regeneration (3) reactions are carried out in the same reactor alternating the periods of reaction and regeneration.

12. Method according to claim 9, characterized in that the oxidation and the regeneration (3) reactions are carried out in a reactor with a moving bed.

13. Method according to one of claims 1 to 7, in which:

a) the initial gaseous mixture is introduced into a first reactor with a moving catalyst bed,

b) at the outlet of the first reactor, the gases are separated from the catalyst;

c) the catalyst is returned into a regenerator;

d) the gases are introduced into a second reactor with a moving catalyst bed;

e) at the outlet of the second reactor, the gases are separated from the catalyst and the acrylic acid contained in the separated gases is recovered;

f) the catalyst is returned into the regenerator; and

g) the regenerated catalyst from the regenerator is reintroduced into the first and second reactors.

14. Method according to claim 13, in which the first and second reactors are vertical and the catalyst is moved upwards by the gas flow.

15. Method according to one of claims 1 to 14, characterized in that the oxidation reactions are carried out with a residence time of 0.01 to 90 seconds in each reactor.

16. Method according to claim 15, characterized in that the oxidation reactions are carried out with a residence time of 0.1 to 30 seconds in each reactor.

17. Method according to one of claims 1 to 16, characterized in that the propylene produced and/or the propane which has not reacted are recycled to the inlet of the reactor , or if there are several reactors, to the inlet of the first reactor.

18. Method according to one of claims 1 to 17, in which the reactor, or when there are several reactors, at least one of the reactors, also comprises a cocatalyst corresponding to the following formula (II):

$$Mo_1Bi_{a'}Fe_{b'}Co_{c'}Ni_{d'}K_{e'}Sb_{f'}Ti_{g'}Si_{h'}Ca_{i'}Nb_{j'}Te_{k'}Pb_{l'}W_{m'}Cu_{n'} \quad (II)$$

in which:

- a' is comprised between 0.006 and 1, inclusive
- b' is comprised between 0 and 3.5, inclusive;
- c' is comprised between 0 and 3.5, inclusive;
- d' is comprised between 0 and 3.5, inclusive;
- e' is comprised between 0 and 1, inclusive;
- f' is comprised between 0 and 1, inclusive;
- g' is comprised between 0 and 1, inclusive;
- h' is comprised between 0 and 3.5, inclusive;
- i' is comprised between 0 and 1, inclusive;
- j' is comprised between 0 and 1, inclusive;
- k' is comprised between 0 and 1, inclusive;
- l' is comprised between 0 and 1, inclusive;
- m' is comprised between 0 and 1, inclusive; and
- n' is comprised between 0 and 1, inclusive.

19. Method according to claim 18, in which the cocatalyst is regenerated and circulates, if appropriate, in the same way as the catalyst.

20. Method according to claim 18 or claim 19, in which, in the cocatalyst of formula (II):

- a' is comprised between 0.01 and 0.4, inclusive;
- b' is comprised between 0.2 and 1.6, inclusive;
- c' is comprised between 0.3 and 1.6, inclusive;
- d' is comprised between 0.1 and 0.6, inclusive;
- e' is comprised between 0.006 and 0.01, inclusive;
- f' is comprised between 0 and 0.4, inclusive;
- g' is comprised between 0 and 0.4, inclusive;
- h' is comprised between 0.01 and 1.6, inclusive
- i' is comprised between 0 and 0.4, inclusive;
- j' is comprised between 0 and 0.4, inclusive;
- k' is comprised between 0 and 0.4, inclusive;

- l' is comprised between 0 and 0.4, inclusive;
- m' is comprised between 0 and 0.4, inclusive; and
- n' is comprised between 0 and 0.4, inclusive.

21. Method according to one of claims 18 to 20, in which, a weight ratio of the catalyst to the cocatalyst greater than 0.5 and preferably of at least 1 is used.

22. Method according to one of claims 18 to 21, in which the catalyst and the cocatalyst are mixed.

23. Method according to one of claims 18 to 21, in which the catalyst and the cocatalyst are present in the form of pellets, each pellet comprising both the catalyst and the cocatalyst.

24. Method according to one of claims 1 to 23, comprising the repetition, in a reactor provided with the catalyst of formula (I) defined in claim 1, and if appropriate, the cocatalyst of formula (II) defined in claim 18, of the cycle comprising the following successive stages:

1) a stage of injection of the gaseous mixture as defined in claims 1 to 3;
2) a stage of injection of water vapour and, if appropriate, inert gas;
3) a stage of injection of a mixture of molecular oxygen, water vapour and, if appropriate, inert gas; and
4) a stage of injection of water vapour and, if appropriate, inert gas.

25. Method according to claim 24, characterized in that the cycle comprises an additional stage which precedes or follows stage 1) and during which a gaseous mixture corresponding to that of stage 1) but without molecular oxygen is injected, the molar ratio propane/molecular oxygen then being calculated globally for stage 1) and this additional stage.

26. Method according to claim 25, characterized in that the additional stage precedes stage I) in the cycle.

27. Method according to one of claims 24 to 26, characterized in that the reactor is a reactor with a moving bed.